To. NOAA Science Advisory Board
From. Climate Working Group
Date. April 8, 2020

Topic. Opportunity for COVID-19-related Earth System monitoring and prediction efforts as a result of worldwide shelter in place/ stay at home policies.

There has been a sudden drop in aerosol and carbon emissions as industries, transport networks, and businesses have closed down in response to the COVID-19 pandemic. The nearly step-function changes in aerosols, nitrous oxide, and carbon dioxide emissions vary regionally, creating a unique opportunity to assess our predictive capabilities over these spatial scales and to provide data on health-pollution relationships. These changes, primarily associated with significantly reduced transportation due to "stay-at-home" policies, will be temporary and simulations of the return to normal emissions profiles will provide additional understanding. There is now a unique opportunity to study pre- and post-COVID-19 effects of emissions reductions, in general, and for seasonal prediction, in particular. Aerosol-cloud-radiation interactions remain one of the largest sources of uncertainty in climate modelling and earth system prediction.

We acknowledge NOAA's valiant efforts to maintain their unique service to the nation under these challenging conditions and recognize that capitalizing on this opportunity may not be possible, but we are inspired to hope because of NOAA's tradition of ingenuity and resilience in providing environmental intelligence for better decision making.

While recognizing and endorsing the need to protect its workforce and to continue to carry out its mission, the Climate Working Group suggests to the NOAA Science Advisory Board that NOAA:

1. ***Assess "What can NOAA do?"*** – NOAA should assess the feasibility of rapid response studies of the impact of COVID-19 "shelter-in-place" practices on atmospheric constituents and their effects on the radiation budget.
2. ***Assess "What can NOAA organize?"*** – NOAA should implement appropriate cross-agency and external organization to capture the impacts of COVID-19 "shelter-in-place" practices on our ability to predict the Earth System.
3. ***Assess "How can NOAA help?"*** – NOAA should collaborate with health and epidemiological agencies to assess whether these direct pollution and climate effects have quantifiable and predictive human health repercussions.

Acknowledging the importance of individual safety and health, and the challenges to meet core mission requirements, NOAA should determine whether it is possible to direct internal NOAA personnel to this opportunity and potentially critical objectives.

The three objectives of these actions would be:

1. Observe, aggregate, and quantify the response of aerosols, radiatively active gases, and their radiative effects that have occurred in response to the pandemic-related decrease in transportation and manufacturing. This would require securing ongoing aerosol, atmospheric chemistry, and radiation monitoring from space and *in situ* networks. A rapid response to obtain these data is essential.

2. Bring together key modelling centers to explore and compare the impacts in their systems. This might involve initializing forecasts with COVID-era versus normal emissions to determine where the simulations diverge (or do not) from observations to evaluate our understanding of the atmosphere and Earth System and our predictive capabilities.

3. Collaborate with public health agencies and assess NOAA's environmental prediction capability in terms of forecasting favorable/unfavorable conditions for vector-borne diseases and in understanding the spreading mechanism of epidemic or pandemic (e.g., airborne disease) that may be (partially) attributed to physical environment changes (in temperature, humidity, airflow, aerosol, weather-climate pattern, etc.)

In conclusion, and again acknowledging the importance of individual safety and health, the CWG recommends focus on and application of resources to this unique opportunity to study pre- and post-COVID-19 effects of emissions reductions, in general, and for seasonal prediction, in particular.